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SELECTED TRANSLATIONS ON EAST EUROPEAN HEAVY INDUSTRY

No 7

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## FOREWORD

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SELECTED TRANSLATIONS ON EAST EUROPEAN HEAVY INDUSTRY

No 7

This is a serial publication containing selected translations on the manufacturing and chemical industries in Eastern Europe.

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## CZECHOSLOVAKIA

### MINING MACHINERY AT THE 1960 BRNO FAIR

[Following is the translation of an article by Ing. Jan Kolar in Uhli (Coal), Vol II, No 12, Prague, December 1960, pages 328-329.]

#### Roll Cutter-Loader KSV-60-E (CSSR)

The fast development in the mechanized mining of coal by narrow-miter roll-machinery throughout the world is also mirrored in the development of our roll cutter-loader KSV-60-E. This machine, which has been delivered for several years with the usual full roller, has been exhibited for the first time this year with a newly designed, developmental, disengaging part. During its construction the tendencies followed by all world manufacturers of roll-mining cutter-loaders were considered. It is primarily an improvement of the lump quality of the mechanically disengaged coal, which is not very advantageous in the parts of standard roll construction. A further improvement was made in the mechanical lifting of the disengaged coal to the rubble transporter. The new disengaging organ UDM (illustration 1) solves these requirements through a sectional construction formed by massive segments, which have on their circumference two tool holders. This solution enables us to form parts with varying work engagements, with various adjustments of the tool helix, etc. The entire part is easily disassembled. The improvement in the work function of the disengaging mechanism is supposed to ensure an increase in the space between its individual segments. Those pieces of the disengaged coal which failed to be thrown off by the movement of the blades onto the loading pan of the machine will be pushed through this space towards the conveyor during the turning of the mechanism. Thus, it is possible to prevent a further secondary crushing of coal, as is usual in the case of the standard roll organs. (The disengaging organ in illustration 1 is meant for a left cut and not for the right cut, as had been demonstrated at the fair by mistake.)

#### Roll Cutter-Loader KWB-2 (Poland)

The current construction of the roll mechanism is used in the Polish cutter loader KWB-2 (illustration 2). On the roller, which is divided in the middle, are attached the knives



Illustration 2

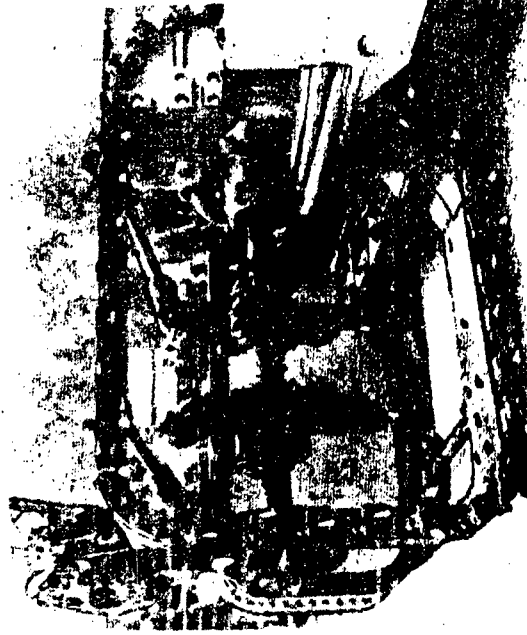


Illustration 5

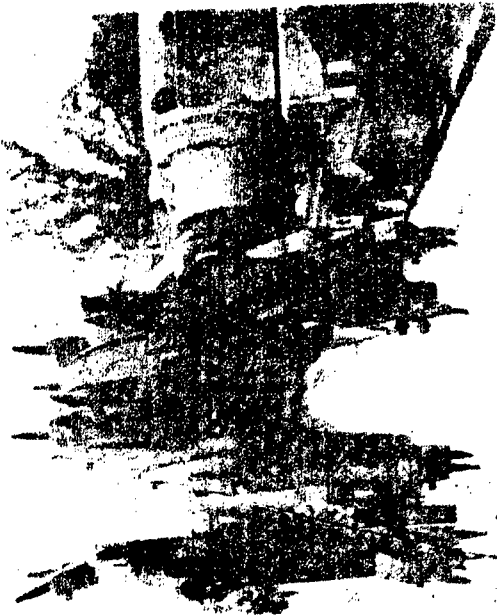


Illustration 1



Illustration 3

(tools). A certain operational deficiency of the holders used is the fact that the indispensable lower ejector holes for the knives are missing. The cutter-loader KWB-2 is, however, interesting because of another component, namely, the loading plough (illustration 3). In contrast to other constructions, the plough has a construction symmetrical to its transverse axis. On both its ends are stripping planes, adjustable for height. Pushing the disengaged coal onto the rubble conveyor in both directions of the movement of the cutter loader is facilitated by a curved segment, which rotates around a massive central pin. The attachment of the loading plough to the machine itself is placed at its lower portion. The purpose of the construction of the plough is to improve the loading of the coal onto the conveyor, when the length of the plough has been shortened.

#### Chain Mining Cutter-Loader KPW-1k (Poland)

A construction similar to the Soviet chain cutter-loaders can be seen in the Polish machine KWP-1k (illustration 5). The block of coal cut off by the curved arm is cut further by a bar with two semicircular segments. Characteristic is the use of a vertical cutting arm with upper equal-seamed discs. Their purpose is to facilitate a self-loosening of the coal gallery, which has not been mechanically disengaged. The loading function of the cutter-loader is taken care of by the usual type of a two-sided rubble-chain loader. The most important technical data are given in Table II.

Table II

Working output of the main motor	kW	95
Working speed of the machine	m/hour	to 100
Working engagement of machine (test)	m	1.2
Height of the engagement of the machine	m	1.25



## CZECHOSLOVAKIA

### THE CHEMICAL INDUSTRY AND THE CZECHOSLOVAK ACADEMY OF SCIENCES

The December meeting of the UV KSC /Ústřední Výchov Komunistické Strany Československa -- The Central Committee of the Communist Party of Czechoslovakia/ is an important landmark in the work of the Czechoslovak chemical industry. The workers in all of the factories and plants of the chemical industry have devoted great attention to its decisions on how to secure the rapid development of the chemical industry during the third Five-year Plan. The same is true of the chemical section of the Czechoslovak Academy of Sciences.

The task of the CSAV, stemming from the decisions of the UV KSC is, first of all, to direct basic chemical research to the complex use of the raw material supply, especially to the study of the products of the coking of black coal and refining lignite. In the Institute of Organic Chemistry and Biochemistry, there will therefore continue to be systematic experimentation with lignite composition with a view toward the possibilities of practical exploitation of its waxes, terpene and other contents. The work of the Institute for Theoretical Principles of Chemical Technology is directed toward a successful utilization of aromatic alloys from lignite tar. Besides that, this institute will continue the study which aims to further the development of the raw material basis for the production of terephthalic acid as the initial substance for synthetic fibres which would correspond to wool.

In the field of multi-molecular substances, a further important task is the basic research for which the newly built Institute for Macromolecular Chemistry is especially designed. Special attention will be devoted to caprolactene and polyvinyl chloride. At the same time there will be study, not only of the reactions that form these plastic substances, but also of the spontaneous changes that lower the stability and resistance of polymers. This research will obviously be concerned with the new types of plastic matter. For example, it will study the polymers that act as their own semi-conductors, and the increased resistance to heat and hydrophylic jelly for medicinal purposes.

The Institute for Theoretical Principles of Chemical Technology will continue experimentation with organic silicone compounds. The aim of this research will be to improve the production of silicone caoutchouc without soluble lacquers, special resins and others. In the scope of natural macromolecular substances, the most economical utilization of wood, which will be the object of special attention at the Academy of Sciences, is of foremost interest to industry.

New opportunities are opening up in modern chemical industry for the use of catalytic processes. The principal aim of basic research is centered primarily in the Institute for Physical Chemistry; it is to

explain the mechanisms of catalytic reactions and find all the causes for the activity of catalysts so that it will be possible to replace empiricism with theoretical predictions.

The CSAV will furthermore observe the basic problems of chemical engineering in order to obtain some general ideas about the basis on which it would be possible to perfect the suggestions for modern machinery installations. Specially designed analyzers will work out the requirements for automatization of the chemical industry, study the technological process and signalize every change to the central regulatory system. The centers for scientific research under the CSAV will be of great help to the chemical industry and to the systematic development of modern, preparative, classified and physical methods.  
(Prague, Hospodarske Noviny, 21 April 1961, page 3)

## EAST GERMANY

### COMMON TASKS OF THE CHEMICAL AND MECHANICAL ENGINEERING INDUSTRIES

Following is the translation of an article by Walter Singer in Chemische Technik (Chemical Engineering) No 10, Leipzig, October 1960, pages 561-564.

#### Common Successes

The great successes of the chemical industry of the GDR, achieved especially during the great chemistry plan, are unquestionably in large part successes of the mechanical engineering industry. It is apparent that the efficiency of our chemical engineering industry has improved recently, and on this foundation we may view optimistically the further execution of the chemistry plan. This statement, obvious as it may sound, is necessary; in considering development problems in the chemical industry, it is often forgotten that each development is determined by the capacity of the mechanical engineering industry, and that the success of every technological step in the chemical industry is based in large part upon the accomplishments of the mechanical engineering industry.

It is to be regretted that some specialists in both industries have hesitated to draw upon the results for their own work. Real progress can be achieved only if close collaboration at all production stages exists and if equipment production in both industries is introduced. Further, a common technical language must be spoken; that is, a uniform scientific foundation must be created for the common effort. This foundation must be technical-organizational as well as scientific-technical.

#### Uniform Scientific Foundation for the Common Task

Unfortunately, it must be said that this necessary collaborative work in the chemical and mechanical engineering industries has not yet grown in the manner required for the rapid development of the chemical industry. This is not due to any lack of goodwill on the part of those involved or to any basic failure to recognize the need, but it is certainly due to unsatisfactory organization for this common task. In my opinion, the reason for the unsatisfactory organization is to be sought in the lack of a uniform scientific system which would make possible the common handling of problems. In short, we must find a uniform platform for our common effort. This collaboration platform between mechanical engineering and chemistry is to be found in process technology; its foundation is the setting up of a classification system for technological processes which can also be a guide for the mechanical engineering industry. The scientific foundation for the common task must be

classification system for all the basic processes in the chemical industry. For all basic processes there are corresponding forms of devices, equipment, or machines, with the help of which each basic process can become operative.

Some advantages of such a classification system are:

- 1) It becomes possible for the first time to coordinate all jobs in these fields, irrespective of their location, and to prevent errors and duplication of effort.
- 2) It becomes possible to determine where development is deficient and to secure supplies to meet all requirements.
- 3) It brings together the qualified skilled workers in chemistry and mechanical engineering for common labor in the right places.
- 4) It is the foundation for simplifying and unifying the production and supply of chemical equipment.
- 5) It facilitates standardization of chemical equipment and creates for the first time the preconditions for developing standard models and introducing the mass production of chemical equipment.

On the foundation of this uniform classification system, it becomes possible to produce a system for cataloging chemical equipment, which could be made as complete as desired.

#### The Necessary Organization for Developing and Producing Chemical Equipment

The scientific foundation for standardization and the specialized and concentrated production of chemical equipment must be found in a classification system of basic operations. Present specialization in mechanical engineering is carried on largely from the point of view of production. For chemical engineering other points of view must be considered.

For each basic operation there should be an appropriate scientific-technical center with appropriate management. All problems of equipment development should be thoroughly worked over in this center. Overall consultations should be held on the most suitable system to be adopted. An instruction center for applying and testing processes should also be set up.

With a foundation of a uniform classification system of basic operations, it also becomes possible to determine exactly where the principal development efforts should be made in building chemical machinery.

#### Standardized Chemical Equipment

In order to achieve rapid growth to the highest possible scientific-technical level, the chemical industry needs a fundamentally new orientation in the technical solution of problems arising from chemical processes. We must, in short, have the courage to break through the age-old obstacles to building up our chemical production by adopting a classification system similar to the one long in use in mechanical engineering centers. To say

that chemistry must have a mass production of constantly modified equipment does not lead us in the direction of adopting rational systems for building chemical plants.

We must resolutely strive to construct chemical plants according to a system of standardized unit manufacture, utilizing standardized equipment, machines, and construction units. As far as possible, special types of equipment also should be developed from standardized units.

This principle must be applied throughout. It must begin with the planning and designing and include machine building and installation.

The method to be chosen in planning chemical plants must be that of model designing. Only those models should be used which are copies of standardized machines and units. In this way the use of standardized parts is established right from the original design. The production of specialized types must remain limited to a few, carefully considered, exceptional cases.

One of the tasks of mechanical engineering in its production program is to provide suitable standard models, with catalog documentation, for all existing standardized equipment.

The construction of chemical plants should be undertaken only if standardized machines are to be used. Mechanical engineering must see to it that for all important operations in chemical plants the most suitable required equipment is available in a standardized form, either from its own stock or through international socialist cooperation.

For machine deviating from the standard in form or size -- and these are not uncommon in the present state of development, particularly in new developments -- standardized units must be provided from which the specialized forms may be assembled. There are numerous examples of this procedure. It is used, for example, in distillation and refining plants.

We must in principle oppose the use of different types of machinery to fulfill the same or a similar purpose. These different types are often products of capitalist competition, and it is wrong to adopt them. Rather, it is urgently necessary to take consistent measures to limit the various types of machines serving the same purpose. This is even simpler today, since scientific knowledge in the field of process technology has grown very rapidly in the last two decades. Actual operations can be carried out more scientifically with facilities for exact calculations and equipment design.

However, building complete, standardized production plants must not be done under any circumstances. This would mean that such plants would be already obsolete when they become fully operative. In all our efforts we must give attention to the greatest possible simplification and unification, and at the same time see that this development in no way robs us of the means to consider quickly new information and rapid alterations. The modern system of chemical plant development is characterized by the use of standardized units; this permits the manifold and readily adaptable construction of complete plants with complete equipment.

In the development of the chemical industry we must basically distinguish between standard equipment and specialized equipment.

Standard equipment includes equipment used in virtually every chemical plant and for various purposes in other industries. Among these are equipment for the transportation and storage of materials, and regulating, measuring and control equipment.

Equipment in these categories should naturally be developed by mechanical engineering to meet the requirement programs of the chemical industry. The task of the chemical industry is to combine the types most suited to its operations into selected models for compulsory use.

Specialized equipment includes pieces limited almost entirely to the chemical industry for certain processes only, and in small quantities. The so-called reaction machines are conspicuous examples. Equipment of this kind can be developed only with the closest collaboration between the chemical and mechanical engineering industries. As we have already mentioned, however, this equipment ordinarily should not be developed as a special piece of construction, but produced from standardized units.

#### Rapid Development through Mass Production

The required rapid development of the chemical industry is impeded to a certain degree at the present time by the fact that the mechanical engineering industry is not in a position to carry out the required rapid delivery of new machinery. The adoption of standardized parts and a system of standard unit manufacture would bring about a fundamental change. From a supply of mass-produced units, the required machinery could be built and installed in chemical plants quickly, without the long, obstructing delays in delivery that have so long prevailed.

Only the conversion from a system of limited production (Massanfertigung) to one of standardized production of machinery can create the preconditions for the conversion also of chemical engineering to mass-production with its great economic and technical advantages. Mass-production makes it possible to satisfy the growing need for general chemical equipment at low cost and with small consumption of material.

#### Production of High-Capacity Equipment

The scientific-technical standing of a chemical production plant is determined not only by the level of its chemical processes but more particularly, as we know, by the scientific-technical condition of the equipment it uses.

It is especially important to develop and build equipment of the highest capacity per unit of space or area and of the lightest weight or, as the case may be, the smallest consumption of raw materials. At times, lightest capacity weight (Leistungsgewicht) signifies that the machinery in question is built with the smallest consumption of raw materials; at other times, it applies to the design and to the expenditure for buildings and foundations. The smallest possible specific area requirement for equipment also results in a reduction in outlay for building construction. Examples of reduced specific area requirements are the newly developed units for alkali-electrolysis, the development of vertical compressors, etc.

In order to obtain equipment with the most favorable technical and economical features, it is usually not sufficient to improve and extend familiar systems; rather, it is necessary also to develop new systems. The development of more productive systems, however, can be accomplished by mechanical engineering only in closest collaboration with the chemical industry. It is a question not only of the mechanical functioning of a machine, but far more of its complex function in chemical processes. Experience has shown that where there is this collaboration, problems have been successfully solved.

#### Insuring an Uninterrupted Long-Term Operation in Chemical Production

The more we carry out full mechanization or, as the case may be, automation while introducing the most highly developed technology, and the more we bring about the required concentration of production by creating larger production units, the more important uninterrupted, long-term operation becomes. Every minute of production truly creates production value in large plants; it is important not to allow any break in production, with its accompanying heavy economic losses. For this reason the quality of chemical equipment takes on ever-increasing importance. This refers to the strength of raw materials utilized for chemical, thermal, and mechanical requirements, as well as to the structural form of the equipment for optimum fulfillment of its functional task, and to the quality of labor in equipment construction and installation.

The most important prerequisite for achieving an uninterrupted, long-term operation in chemical production is utilization of choice, durable raw products in the building of chemical equipment. Experience in various countries has shown that the higher the initial outlay for semi-finished raw products, such as refined steels, plated materials, and special plastics (Plasten) in building chemical equipment, pays for itself in a very short time by increased production and lower maintenance costs. In this respect it would obviously be wrong to want to save in chemical equipment construction. Utilization of costlier raw materials often leads to simplified construction of equipment and to savings in weight, with the resulting advantage. Insuring an uninterrupted long-term operation and a long life for the equipment is decisive for the profitability of chemical production. The importance of this increases with growing production capacity.

It is well known that the chemical industry has the greatest plant depreciation of any industry and that equipment replacement is most extensive in it. Capital investment for replacements and repairs in the chemical industry of the GDR at present amount to 68% of new investments.

Although a part of this depreciation may seem to be labor performance, because of the pace of development in scientific-technical plant production, by far the greatest part at present is in materials. The magnitude of this depreciation should give cause for serious reflection. It is vitally important for further rapid general development, but particularly for the profitability of chemical production, that the present

useful life of chemical equipment be considerably prolonged.

### Maintenance Productivity

The growth of labor productivity in the chemical industry, particularly in view of the crucial need for conserving manpower, depends not only on mechanization and automation of chemical production, but is decisively affected by the productivity of all the vital support and secondary services, and especially plant maintenance. It is well known that a considerable portion of the expenditure for labor in the chemical industry is in the area of technical support and secondary activities.

The experience of recent years has shown that maintenance productivity has not kept pace with the growth of chemical production and that this lag is becoming a hindrance to the growth of overall productivity. In order to go forward, not just step by step but with a decisive leap, we must blaze new trails. The problem is similar to the one in the construction industry, with conversion from manual labor to industrial building methods. The chemical industry must no longer do its repairs by hand but must use industrial methods for maintenance. Chemical industry maintenance should be concentrated on the exchange or renewal of worn-out parts, spare parts, structural units, and standby machines. This presupposes, however, that (1) standardization and standard unit manufacture of chemical equipment are consistently carried out; (2) adequate and short-dated standardized spare parts, structural units, etc., are made available; (3) mechanical auxiliary devices for installations (Montagehilfseinrichtungen) are built to produce a highly efficient installation; (4) primary chemical workers are trained to install chemical equipment as a secondary occupation.

### Automation in the Chemical Industry

The meaning of automation in the chemical industry may be summed up as follows:

1) Automation makes it possible to adhere to optimum reaction conditions with minimum use of basic materials and power. A constant operation is assured, together with the greatest possible plant stability. Breakdowns are largely avoided and a high quality product obtained. Because of the great speed with which the standard equipment operates, maximum exploitation of plant capacity becomes possible.

(2) The automation of chemical processes guarantees a very high measure of technical safety. Safety hazards are virtually eliminated by the great speed and prompt regulation of every reaction change. This is particularly important with products involving danger of fire or explosion. In these cases it becomes possible, by means of special automatic devices, to cut off the power, shut down the entire plant, or release protective devices.

Automation normally makes it unnecessary for service personnel to reside in close proximity to producing plants. This eliminates the effect of noxious vapors, a hazard to those residing close to dangerous



products. Favorable bio-climatic conditions are much more easily created for the relatively small areas of the main control centers than for the total complex of larger plants.

(3) The maximum growth in labor productivity, attainable through automation in other industries, can be achieved in the chemical industry by adopting measures for creating the pre conditions for automation. Automation is an effective lever for forcing an entire industry to bring its technical-scientific production processes, etc., to the highest level. In carrying out automation, chemical plants are forced into a complex mechanization of the entire production and to a reorganization and revision of all production processes. In this way, automation takes place by itself. Another essential measure is building an effective administration for the automation of chemical production.

For optimum achievement of automation in the chemical industry, various preconditions should be created:

First, and this should never be forgotten, an effective organization should be built to direct the automation of chemical production toward a consistent specialization and concentration of production with a comprehensive standardization of chemical products.

Further, it is the integrated task of both the chemical and mechanical engineering industries to create the necessary technical-preconditions for building automated production. In addition, mechanical engineering must particularly produce the necessary modern equipment to apply a continuous, fully mechanized labor system. While the preconditions for automation are being created, labor productivity will simultaneously increase.

We must, unfortunately, admit that the development of much of the equipment needed for automation, particularly measurement, regulating, and control instruments, is lagging behind.

This lag can become a serious obstacle to the rapid attainment of the highest scientific-technical level in the chemical industry, for which automation is a necessary step. There is a lag, too, in the preconditions to be created by chemistry itself, for example, in exact knowledge of reaction times, optimum reaction conditions, etc.

As is the case with all other problems in the field of chemical equipment, automation of chemical production can be done only by creating all necessary preconditions through the closest collaboration between chemistry and mechanical engineering.

#### The Development of the Chemical Industry: a Collaborative Effort by Chemistry and Mechanical Engineering

The time has long past when chemists alone developed new processes and designed new machines for them. Today, successful scientific-technical development in the chemical industry requires the collective effort of all related activities.

Technical implementation of the actual chemical steps and required physical processes is often more difficult than the original ideas themselves. This has been shown by experience in developing almost all

modern processes. Accomplishment of the technical implementation of a process calling for highly scientific, standardized units demands, along with a highly developed technique, thorough organizational and economic mastery of the problem.

It is necessary to attract specialists as soon as possible from mechanical engineering and from chemistry to initiate a socialist, collective effort. On the one hand, no development of chemical processes should take place without specialists from mechanical engineering; on the other, no development of chemical equipment should occur without specialists from chemistry. It is important to consider that this collective effort is not confined to the problems of the GDR; it should be implemented so as to produce all possibilities of international socialist collective labor and to include our friends from other socialist countries.

Unquestionably, such a new kind of labor requires a certain change in our attitudes toward these problems. The necessity of surmounting the barriers of authority and overcoming bureaucratic obstacles should not be considered last.

Experience has shown that work done in the professional departments of the Ministry of Engineering, which, as is well known, is not deterred by any obstacles of this kind, is a particularly advantageous and fruitful means for solving these problems.

The collective labor of the professional societies "Chemische Technik" (Chemical Engineering) and "Maschinenbau" (Mechanical Engineering) can serve as a model for the necessary collective effort of all institutions in both branches of industry. The combined labor conference of the "Chemical Engineering," "Mechanical Engineering," and "Electro-Engineering" professional societies on 3 November 1960 in Leipzig, on how to attain the highest scientific-technical level in chemical equipment, will serve as an example of how collective labor must be conducted in order to achieve common success.

EAST GERMANY

MECHANICAL ENGINEERING AS THE LEADING FORCE  
IN THE DEVELOPMENT OF CHEMICAL EQUIPMENT

Following is the translation of an article by Heinz Jechorek in Chemische Technik (Chemical Engineering) No 10, Leipzig, October 1960, pages 565-566.

On 1 September 1959 the Volkskammer of the GDR passed into law the Seven-year Plan on the development of the people's economy of the GDR for the years 1959-1965. This law is based on the resolutions of the Fifth Party Congress of the Socialist Unity Party of Germany, which had the full approval of the working force of the GDR.

The Seven-year Plan for the development of industry provides for an increase in industrial production of 188%, together with a growth in labor productivity of 185%. To achieve these results, yearly investment will be increased from 12.3 billion marks in 1958 to 25 billion marks in 1965. In order to fulfill all their tasks under the Seven-year Plan, the metal-working industries of the GDR must raise their production an average of 218%.

Execution of this plan has assured fulfillment of the principal economic task up to 1961.

The principal item in the plan is our chemistry program. The chemistry program conference on 3 and 4 November 1958 in Leuna demonstrated that its systematic accomplishment presuppose a comprehensive mechanical engineering program. High-grade chemical equipment is a requirement of the chemical industry for fulfilling its tasks under the plan. This equipment, to be delivered by the mechanical engineering industry, will afford chemists for the first time the possibility of implementing their ideas and will give workers in chemical plants the preconditions for fulfilling a proposed increase in production in their industry of 205%.

The branch of industry responsible for the equipment part of the chemistry program, the chemical and air-conditioning establishments, must raise production 283% and labor productivity 231% to fulfill its tasks under the Seven-year Plan. This is considerably above the average increase for mechanical engineering. It is already apparent from these few figures what crucial problems the mechanical engineering industry, in particular the VVB chemical and air-conditioning plants, must solve in carrying out the chemistry program.

The rapid tempo that must be employed in developing the production of chemical equipment and the change from the delivery of individual pieces to the delivery of complete installations by the mechanical engineering industry demand the consistent application of comprehensive planning.

The planning methods in use heretofore no longer suffice for carrying out the chemistry program. For this reason, the directors of the State Planning Commission on 13 April 1960 passed a resolution "Über die Verbesserung der Planung des Ausrüstungsvolumens" (On Improved Planning for Equipment Volume). The terms of reference for cooperation are here systematically set down. The administration of the mechanical engineering industry clearly is responsible for the delivery of complete chemical installations.

Extensive work must still be done to gear the thinking and performance of factory workers, technicians, engineers, and business associates to the integrated task of delivery of complete chemical installations. Also those in charge of investment, that is, the managers of chemical plants, must take this fundamental change into account in making their investments. This should begin with the formulation of chemical processes and with project designing. The early organization of proposal groups (Objektkollektiven) affords all those concerned with investment in the chemistry program the opportunity of preparing measures at the proper time for accomplishing these tasks.

This is especially important for carrying on the work of development and standardization in the chemistry program. Only by so doing can the builders of machines and equipment discern the trends of development and adapt the subjects of research, development, and standardization to the needs of a constantly evolving process engineering.

The Institute for Chemical and Refrigeration Equipment, formed in Dresden in July 1959, is concerning itself fundamentally with the development demands and standardization problems of the chemical industry, and is coordinating them with the corresponding institutes in industry, gymnasia, the German Academy of Sciences, the Central Council for Research and Engineering, and the Council for Standardization.

It is important for all those in authority participating in implementing the chemistry program to consider the central position of the Institute for Chemical and Refrigeration Equipment. Plans for developing chemical equipment that are not coordinated here run the risk of being left out of consideration in the research, development, and standardization plans of the institutes and enterprises.

The mechanical engineering industry requires strict observance of this principle on the part of the chemical industry. In deliberations on research and development, the institute generally makes use of the Central Labor Circle. In all, members of the Institute for Chemical and Refrigeration Equipment collaborate in twelve labor circles. The labor circle directs consultations on refrigeration engineering, gas analysis, low temperature technology, air and heat installations, machinery, and tools. The leaders of these labor circles are also heads of the corresponding professional departments in the Institute for Chemical and Refrigeration Equipment. The composition of the labor circles is such that representatives of the chemical industry, gymnasia and professional schools, mechanical engineering enterprises, and scientific institutes can discuss and define the matters to be decided and control their execution.

Unfortunately, much too little use is made of the opportunities afforded in the labor circles for measurably influencing the trends of development. The chemical industry must make itself felt here more strongly, so as to reduce the great number of individual handlings of research and development problems to a small range of genuine special subjects.

The colleagues delegated in the labor circles and labor associations in all cases share responsibility for fulfilling the assigned tasks.

As for the development of high-grade equipment, a close collaboration has been organized in the rubber processing industry between VVB Gummi-Asbest and its plants, and VEB 1 Maschinenfabrik Karl-Marx-Stadt; this is beginning to bear fruit.

A technical-scientific center for rubber-processing machines exists in 1 Maschinenfabrik Karl-Marx-Stadt and, with the support of the rubber-processing industry, will shortly be in a position to assume the leading role in development of this branch of industry.

For testing equipment as to its suitability for projected processing operations, some plants have established shop schools. In this connection it will be necessary to examine thoroughly to see whether or not the same goal can be reached more quickly and economically by an efficient utilization of already existing training facilities in chemical plants and in technical laboratories.

An important aid for research and development is the use of professional literature. The documentation section of the Institute for Chemical and Refrigeration Equipment issues short compositions in card index form on the newest publications in the field of chemical machinery construction in the socialist camp and in the capitalist economies. It produces original texts and translations.

The increase in production and labor productivity required in the Seven-year Plan is forcing chemical and air-conditioning establishments to devote special attention to questions of standardization and specialization of products. The industries are determined to enforce a radical standardization and far-reaching specialization of their products.

Select and model units will be built wherever they can be suitably manufactured in large numbers. This refers not only to complete model sets, but also to construction parts.

A good start has been made. The standardization plan in the chemical and air-conditioning industries was fulfilled 100% in 1959 and the first half of 1960.

Beyond our borders, the CEMA is working intensively on international standardization. In the large area of the socialist camp we can go far beyond the standardization of individual pieces of equipment. The building of standard and special models of aggregates and technological production lines is the goal of the labor groups and sections in the Commission for Mechanical Engineering and the Commission for Chemistry. Basic research, development, and construction also are discussed and coordinated in these commissions.

This means that the resources and experiences of the member countries of the CEMA are available to us in fulfilling the tasks of the

Seven-year Plan. True to the principles of the international socialist division of labor, the development of chemical machine construction in the GDR is proceeding in harmony with the systematic development of this branch of industry in all the socialist countries.

The increase in production and labor productivity will be achieved through the socialist reconstruction of our industry. Socialist reconstruction requires an indissoluble union of politics, economics, and engineering. The solution of principal economic problems is crucial for the tempo of this effort.

In 1961 for the first time, the "New Engineering" plans will be implemented by the industries. The precise execution of this comprehensive plan assures the rapid, proportional development of mechanical engineering products to the highest technical level and the achievement of production under optimum conditions.

One further word to our colleagues in the chemical industry, especially to those engaged in project designing: The efforts of machine builders must be supported in the future much more extensively and with greater understanding. This is especially true for the application of existing standards and for cooperation in the rapid perfection of new standards. To a great extent, repeated use of machines must be provided for in project designing. In any case, it pays to investigate thoroughly before drawing the final design. Thought must be given to the advantages of this procedure in planning, construction, and production in mechanical engineering plants, as well as in chemical production. In project designing and in process engineering, consideration should also be given as to how the designs will actually work out. The VEB Komplette Chemieranlagen Halle will pay particular attention to this in the future in undertaking its tasks.

If these principles are more carefully observed by all collaborators in the chemical industry, the tempo of development will be substantially accelerated to the benefit of the entire working force of the GDR.

## EAST GERMANY

### STANDARDIZATION IN THE FIELD OF SEMICONDUCTOR TECHNOLOGY IN THE GDR

(Following is the translation of an article by T. Jaszcz in Radio und Fernsehen (Radio and Television), Vol 10, No 14, Berlin, July 1961, pages 427-428.)

When, about 12 years ago, the generally well-known transistor was discovered in the US through the use of semiconductor materials, the victorious march of the semiconductor elements was underway throughout the world. In the GDR removal of war-inflicted ruins was then too much on everyone's mind to allow anyone to enter this significant field.

Only in 1953 did the GDR start the development, and soon thereafter, small-scale production of semiconductor materials.

In 1957 the decision was reached to plan and build a special plant for the production of semiconductor materials.

This late start in this field led us to register a gap of several years in comparison to other countries, the closing of which causes us great concern.

Now we are applying all our energies toward eliminating this gap.

The following article will demonstrate the importance of standardization in this significant industry, and what progress has been achieved to date.

During the first phase of developing semiconductors --namely crystal semiconductors--many firms entered this important field abroad and thus a multitude of semiconductors emerged in many places. The number of applications was smaller than the varieties of materials used. This led to a confusion of **types**, which caused the users of these materials great difficulties in the making, planning and servicing of equipment.

When production of semiconductors started in the GDR, it became desirable to provide dimensions and characteristics interchangeable with the greatest number of foreign products. This was at first difficult to do, since a few years ago no standardization of semiconductors was in sight. The decision was made in favor of the most common types. It was clear to all participants in the effort that standardization of semiconductors must be achieved in the early stages in order to reach concentrated and economical production.

The first premise of standardization was the definition and

fixation of concepts peculiar to this technology. Thus, this effort was undertaken first. Today there are mandatory standards of this kind for crystal diodes, TGL 6508, for transistors, TGL 6548, and for crystal rectifiers, TGL 8094. These standardized conceptual definitions allow for a perfect understanding by all participants, and greatly avoid misinterpretations and misunderstandings.

The next step in the standardization was the creation of standard types and dimensions for components.

As soon as operating values become apparent in the development of new semiconductor materials, and how they can be enclosed, we start working out new standards of types and dimensions.

These type and dimensional standards contain data on outside dimensions and connections of the components, and all data required for the identification of quality and testing of the components. The limited capacity for development and production channels the standardization in the direction of limiting the number of materials to those most critical to industry, however, to satisfy the largest number of requirements within these limitations. This effect of standardization in reducing types of semiconductors gives the manufacturer the chance to concentrate on a given number of types, and to produce large quantities by assembly line methods, and later on by automation, insofar as the disturbing and costly factor of frequent production changeovers has been removed. The improvements and savings of this uniform mass production benefit the consumer and the national economy. Marketing and planning are greatly facilitated by this standardization. Furthermore, the consumer enjoys the advantage of knowing that the values fixed by standardization are legally fixed, and force the manufacturer to remain within qualitative tolerances.

Delivery of components thus standardized as to type and dimensions also assure the user as to resistance against certain mechanical, thermal, and electrical defects, and include data on tests, identification, packing and storage conditions.

Of equally great significance is the standardization of the machines necessary for producing semiconductors, as well as other installations and instruments. The semiconductor technology requires many new production facilities which are being developed in conjunction with the semiconductors. At first, new installations were constructed for each type of semiconductor, while today there are many means of production applicable to a number of types. The development of production facilities of a more sophisticated nature, of multiple use, complete reliability, and economical operation is still in a state of flux, so that not too many instruments can at this time be considered ready for standardization. In some plants, however, standardization has already started. Thus, for example, lapping machines, specially adapted for planing crystals, are being standardized. In the construction of assembly lines which must be permeated with dry air or a non-oxydizing atmosphere, standard units are being made, which following the principle of erector sets, permit the assembly of various assembly lines for different types of semiconductors. In both cases standardization offers the advantage of mass production and inventory economy, which eliminates the usual long delivery periods and which shortens development changeovers and buildup of assembly lines.



In the field of production facilities there is a compelling need to standardize in the immediate future, since the equipment required in great numbers in the construction of semiconductor plants can only be produced economically by the simplification effects of standardization. In view of our limited capacity it must be avoided that identical facilities be built in various places, and standardization is a useful means to this end.



Fig. 1: Original configuration of the OC 871

In connection with this, attention must be drawn to the crystal cutting machines, alloying furnaces, etching equipment and certain measuring instruments, used in all production fields. The same significance is to be given the standardization of specialized materials. The material used in the manufacture of semiconductors must in many instances be of a special degree of purity. At first, it was impossible in the GDR to obtain such pure elements, so that the development and production plants of semiconductors were forced to undertake the necessary purification of materials, or to import the superclean elements. Nowadays, however, a specialized plant produces them, and by cooperating with the consumer and the manufacturer, deliveries have been contracted which provide for testing of purity levels. Within a short period of time 99.999% will be the mandatory purity level for Indium, and work is in progress on a standard for Germanium, produced through the layer fusion method.

Standards are being worked out for the glass-metal fusions, i.e. the glass bushings, required for the hermetically sealed semiconductors, which will be submitted for legal enactment during the current year.

Standardizing the glass bushings leads necessarily to a limitation of the types, which allows the economical mass production of these components. It also fixes the configuration of the components in order to assure the economical advantage in the long run. This is accompanied by the advantage that once standardized, development and production will run a fixed course, which makes for easier storage and spares supply, but above all, for lowest cost.

Along with the advantages of the early standardization, some problems have come up.

When we started with the standardization of conceptual definitions, no legal standards existed in foreign countries or in the GFR, or information to this effect failed to reach us. The few proposals known to us were taken into consideration, since we wanted to adjust our vocabulary whenever possible to international designations. About the time of the promulgation of our legal standards for conceptual definition, sketches of the International Electrochemical Commission (IEC), the Commission on Technical Standards of the DBR (FNE) and the Council of Mutual Economic Aid came to our

attention, which did not coincide in all cases with our conventions. Consequently, there is a need to rework our standards.

Semiconductors developed prior to our becoming aware of IEC recommendations for housing dimensions, insofar as they differ from the norms above, must now be changed. This kind of changeover is costly and disturbs the flow of production. Adherence to international standard dimensions is not always successful or without its difficulties.

Since equipment for the most progressive technological manufacturing methods are not always accessible to us, and since these must be developed here while gaining the necessary experience, quite frequently the first developmental results are functionally acceptable, but outside dimensions are still too large. Thus precision assembly will be required in order to install the semiconductor proper with its support and leads in a standard housing with its tight dimensional tolerances.

For example, transistor OC 871 originally was housed in an enclosure which was hermetically sealed by means of soft solder. Fig. 1 shows a given space between the transistor proper and the enclosure, which permits a comfortable installation. However, the outside dimensions do not correspond to standard sizes. Therefore the members of the standardization group demanded conformity to the standard dimensions. It was especially difficult to remain within the height of 5.5 millimeters. Fig. 2 shows standard dimensions. Since the size of the circular base plate could not be reduced appreciably, it had to be installed at an angle of  $90^\circ$ , and this only left a few tenths of a millimeter between the plate and the housing, and a very accurate precision assembly was necessary.

There is no need, however, to overestimate the problems and difficulties cited, in view of the many advantages derived from an early, thorough and all encompassing standardization in the transistor technology.

In this survey of standardization of the semiconductor technology in the GDR only the most important standardization work was described, and no attention could be given to details on all legal standards and those still in the preparation stage.

While the new technology in semiconductors does not permit full standardization at this time due to its immaturity and the state of flux, it has nevertheless become apparent that in this field, together with the development, standardization enhances the technology, and creates the following advantages:

1. Standardization of concepts and symbols with due attention to international agreements, consequently the possibility of an all around common understanding.
2. Standardization of outside dimensions of the components and reduction in number of types, and thus interchangeability on an international scale. Feasibility of concentrated and economical production.
3. By means of agreements between manufacturers and consumers steady quality is assured and long range planning possible. Spare parts are assured.
4. By means of standardizing production machinery, the development of new, untried components and the construction of new production facilities is facilitated and accelerated. The

heretofore unavoidable time delay in obtaining new installations has been eliminated.

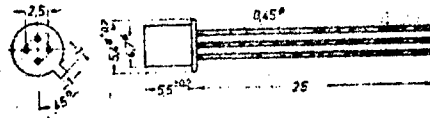


Fig. 2 Standard dimensions of the housing with automation lip and fourth lead

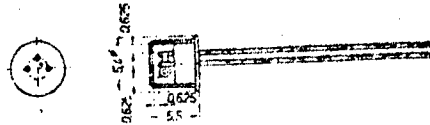


Fig. 3 Semiconductor installed in standard housing

5. By creating standards for special semiconductor materials the manufacturers of semiconductor components are afforded the opportunity to receive the adequate and purified material of homogeneous quality they desire without having to depend as much on imports.

The advantages of this effective standardization have already helped in the past and will further assist in the future to remove the existing gap in the development and production of semiconductor components by pursuing certain goals without deviation or needless delays.

## HUNGARY

### NEW MACHINE TOOLS

[Following is the translation of an article by Laszlo Hodi in Gep (Machine), Vol XIII, No 5, Budapest, 1961, pages 167-175.]

Metal-shaping machines participate directly or indirectly in almost every field of the economy. Developments have hastened the automatization of machinery. The steps of development are: increase of the output of individual machines; increased automatization of the machines; machines capable of several motions and programmed by devices; special purpose machines, and finally, rows of automatic machines.

Demands for far higher accuracy are heard in the industrially developed countries. At the same time, easily replaceable parts are demanded and tolerance limits have been lowered.

All these developments were taken into consideration by the Second Five-Year Plan (1961-1965) for machinery development. This Plan was prepared in accordance with the suggestions of the Council for Economic Mutual Assistance. The Seventh Congress of the Hungarian Workers Party also dealt with the situation in our machine industry and laid down directives. According to these directives, during the Second Five-Year Plan we have to reorient our energies from the manufacturing of universal-type machines to the production of specialized machine tools, specialized machines and machine rows. Among the universal machines the high-productivity and high-accuracy machines have to be emphasized.

The above goals signify the importance of the semi-automatic and automatic machine tools. During the Second Five-Year Plan a significant number of special machines, automatic machines and automatic machine rows must be given to our industry. The overwhelming majority of machines used in our industry are still the universal-type machine tools. They are used not only for the manufacture of single machines but also for series production.

Our machine tool industry already has several types of semi-automatic machines, and according to our plan from 1961 on we will design only semi- or fully automatic machine tools. We also have already started producing machine tools having increased accuracy.

Below we show those machine tools which can already be regarded as products of our machine tool industry.

EMU-200 FP INCREASED ACCURACY UNIVERSAL LATHE (Fig. 1.) The construction facilitates the use of modern turning techniques and assures high accuracy of the work done on it. The rpm of the main spindle can be changed without gears while in operation. The machine has evolved from the EMU-200. Other members of the EMU line are the

EMU-250 and the EMU-250 FP High Accuracy Universal Lathe [FP is the abbreviation for Fokozott Pontosság, meaning Higher Accuracy]. The RMT-16 Revolving Lathe and the RAM-16 Revolving Automat are also derived from the EMU-200 with the full use of the family principle. Further work will develop the basic machine into a turret-head, programmed automatic machine which will do rod work. This will be achieved by a RAM-16 KARTOMAT (Fig. 2.). This machine will have a nine-gear, programmable main shaft which will be driven by an electromagnetic clutch. This clutch insures that the main spindle revolution will be just right for the individual operations. The six feed values on the turret head and the two on the tailstock will be programmed, too. The piece will be put in and taken out automatically. Programming is of the punch-card system.

EKM-200 EXTRA PRECISE LATHE. This lathe is well suited for pieces where high accuracy and excellent surface properties are needed. It belongs to the "accurate tooling-machine" group. Its main spindle is nitrated, has a mirrored running surface and runs on two specially designed expansion slide bearings which were designed according to the hydrodynamical lubrication theory. The starting of the machine is electronically delayed until the formation of a good oil film. The governing spindle is in the middle of the bed and is fully protected from shavings and grime. The bed and the stand are of one casting. The base saddle is made to insure lasting accuracy. The sliding lines are carefully polished surfaces which are constantly lubricated by a special device.

E-400 UNIVERSAL LATHE (Fig. 3.) It is characterized by easy handling, an advantageous rpm range and great surface accuracy which is achieved by the vibration-diminishing effect of the conical slide bearing of its main spindle. The maximum shaving cross-section ( $7\text{mm}^2$ ) indicates large capacity in spite of the machine's relatively low weight. The applicability of the feed cabinet is indicated by the 243 couplings that can be made without shift wheel change. Due to the above, it is an internationally recognized machine in its class. The machine's further development will feature an electrohydraulically controlled feed apparatus, a cycle-controlled copying device, a machined chuck and a pin saddle (Fig. 4.)

The E-400 lathe also has a high-accuracy model which was exported already in 1960.

ETP-500 PROGRAM CONTROLLED PRODUCTION LATHE (Fig. 5.) This machine has great importance among the center lathes, due to its high degree of automatization. It has two copying saddles -- one for roughing, one for leveling -- which enables the machines to handle axle-type pieces in series.

The machine is semi-automatic; except for jamming and taking the piece out, every process, from the roughing to the leveling, is done automatically. If a feed apparatus and a gripping chuck are added,

the machine will be fully automatic and can be installed in a machine row (Fig. 6.).

Roughing and leveling can be done by separate tools in two hydraulically operated copying saddles. The front saddle does the roughing. Its depth is controlled by an automatically controlled buffer drum. The back saddle levels according to a cut-out or a sample (copying lathe). The saddles are fast on their empty run. The rpms and the feeds can be set automatically. The feeds can be halved during the process, and in the copying lathe, during shaving, the rpm can also be changed. When the piece is finished, the machine automatically stops, the saddles return to their original position and the machine is ready for the next piece. The rpm of the main spindle is changed by electromagnetic clutches. Controlling can be done in two ways: automatically with punched cards, or pre-selected by a revolving switch. The operation and the controlling of the feeding mechanism and of the main driving mechanism is the same.

The electrical part is in a separate cabinet. The punched card is in the same place. Every automatically controlled process can also be controlled manually.

The ETP-500 Production Lathe was based on the EU lathes; it is the fifth member of this line of machines. 61% of the parts is interchangeable with the parts of the other machines of the line.

**RT-80 P PROGRAM-CONTROLLED TURRET LATHE (Fig. 7.)** This is a medium-heavy machine with automatically varied rpms and feed. Its rigid construction, large capacity and wide range, and program-controlled rpms make the machine useful for high capacity roughing and leveling turning, aside from multi-tool turning. The machine is useful both for chuck and rod work.

The rpms of the main spindle are changed by the electromagnetic clutches of the 12-scale main driving gear. Controlling can be done in two ways: by punched cards (in serial work) or by an electrical pre-selecting apparatus (this in adjusting and with individual pieces).

The working and control of the 8-scale feed equipment is similar to the main driving gear. The 8 basic feeds can be modified further by the saddle cabinets.

The turret head is revolved by a motor. With the turn of the head the necessary rpms and feed for the next tool is automatically set. This can, of course, be controlled by the punched card.

The motor turning the turret head runs the turret saddle at the same time. The mechanized jamming apparatus saves the worker's energy.

The electrical parts are in a separate cabinet, which also houses the punched card.

The machine is the fourth member of the EU family. Its main and second driving gear and its electrical apparatus are almost the same as that of the ETP-500 and the saddle cabinets and the fast-moving equipment are similar to that of the RT-80 **MECHANICALLY CONTROLLED TURRET LATHE**. The machine, when fully developed, will be fully automatic.

EM 500/320 PROGRAM CONTROLLED SEMI-AUTOMATIC COPYING LATHE (Fig. 8.) This has a newer and more simple control apparatus, shorter adjustment time, less maintenance and cost than similar foreign machines. It is for serial production of axle-like pieces, but disc-shaped objects and borings can also be produced on it, automatically. By using a sample piece, other pieces can be made with it, according to a programmed copying process. After the programming only the jamming and a push on the button (for starting) are left for the worker. The saddles are moved by a hydromechanically controlled apparatus, according to the rolling spindle invention. With this device, the various positions of a stick start the base saddle, stop it, change its direction and speed without the use of a gear.

With a mechanically gripping chuck and a feeding apparatus, the machine can be made fully automatic and can be put in simple and automatic machine rows (Fig. 9.). Apart from its multiple usefulness, a short adjustment period, simple adjusting procedure, low preparation costs and quick versatility characterize this machine. Six gripping changes, six feed changes, and six main spindle rpm changes can be programmed.

RTA-160 PROGRAM-CONTROLLED SEMI-AUTOMATIC TOWER-TURRET LATHE. This modern semi-automatic machine works on pieces that can be gripped by chucks. (Fig. 10.) Its arrangement is similar to that of the classical turret lathes, but has the advantage of having an extra back tailstock. The machine has an automatic cycle and its saddle movements imitate the motions of the manually operated turret lathe. However, the movements of the saddle systems, especially the two-dimensional front length-and vertical saddles, can be programmed so that the lines described by them can be interrupted. This makes possible various inner and outer piercings.

The program control extends to the changing of the rpms of the main spindle, to the adjustment of feed values, and the routes of the front saddle (horizontal and cross) and of the back saddle (piercing). Every saddle unit has a separate governor gear which determines the size, feed and direction of the motion of the saddle it governs. Feeding and jamming by the chuck is also program controlled. The starting and operating commands originate from the programming drum electrically. The program is set down in the program drum, which has a capacity of storing information for 100 different saddle motions. The working routes of the saddles can be programmed to 0.01 mm accuracy. The saddles have nine feed and one quick-running values that can be programmed. The saddles are moved by a hydraulic device using rolling spindle control.

This is the first domestic machine tool using numerals in control. On the program drum of this machine the routes of the saddles can be directly programmed with numerals in 10-digit system. The machine has an excellent productivity index, for it utilizes the idle time. The four different saddles motions can be controlled independently of one another. The machine does not have mechanical position-determining buffers.

Programming can be based directly on the blueprint, which automatically insures the saddle motions and the end points. With an automatic feed apparatus which can be attached (Fig. 11.) the machine becomes fully automatic and can be installed in machine rows. The lubrication system is remarkable. Since the oil tank is limited in size and the heat conducting surface is relatively small, natural heat conducting is not enough and the hydraulic oil is cooled by circulating water.

Lubricating is automatic. Every saddle has separate, piston-pump operated lubrication.

**MU-320 UNIVERSAL MILLING MACHINE (Fig. 12.)** The machine-- which is the basic machine of the line-- is useful for various milling work of medium size pieces. The machine can be used not only for the operations done on general console milling machines, but also for cyclic and programmed work. The wide range of rpms and the powerful motor make the machine useful for cast iron, steel and light metal work. The milling table can be started, stopped, and any part of the table can be shoved and pushed, speeded or slowed by pushbuttons.

All three table parts can be made to do cyclic work with buffers. In the simple cycle the table returns to the original position after its work is performed. In the retraction cycle, the piece withdraws from the tool so the tool will not scratch the piece when the table runs back. Two pieces can be jammed on the table in the pendulum cycle. Here the machine automatically gives the appropriate main spindle rotation direction in accordance with the table's motion.

In programmed works -- such as frame milling -- the machine switches on the motions of the table in a full circular cycle within the limits set by buffers. At the end of the program the machine stops (Fig. 12.).

High accuracy is further insured by the fact that the table parts -- at all speeds -- stop within 0.03 mm.

The extra accessories greatly increase productivity and extend the usefulness, and make the machine available for special tasks.

The main- and service driving gears have separate motors. The spindle rpms can be set from the front of the machine; the execution is electrohydraulic.

Lubrication is automatic. The cooling liquid is pumped by a pump built in with the motor.

The machine is regarded as semi-automatic, for it has to be fed by an operator after every cycle or program. It can be made automatic if a service apparatus is attached for feeding the various axle-like and other pieces. Fig. 13. shows the machine equipped with an automatic dividing head and a separate feed device, hydraulically operated. The pre-lathed axles are put between the dividing head and the pin saddle, the machine mills grooves continuously, the finished grooved axles are taken out by the feeder and the process is repeated.

If the milling machine is to be put in a machine row, the feeder can be formed so that the pieces are put on a conveyer belt.



**KKE-250 CIRCULAR GRINDING MACHINE** (Fig. 14.) The machine is used for flanking and grinding of long cones with small angles of inclination and of short, steep cones. The pieces are worked on between standing and turning tops, jammed into chucks or into clamping capsules. The bearing of the grinding spindle, the capacity of the motor and the rigidity of the machine is such that by using the right material and shape for the grinding disc the pieces can be "speed-ground" with a 50 m/minute angular velocity.

With heavy pieces -- when putting them in or taking them out -- the pin saddle can be governed hydraulically by a foot pedal. The rpms of the piece-revolving spindle can be changed without using gears and can be read off a meter. To insure long life, the grinding spindle rides on a sliding bearing. Lubrication of the sliding leads and of the spindle bearings is automatic. The piece can be ground to the final specifications automatically with mechanical bumpers, in addition to the measuring instrument grinding.

The machine automatically changes from roughing to leveling, and after the final sparking-out stops automatically. The machine is a cycle-programmed semi-automatic one, but when equipped with a feed apparatus, it can be regarded as automatic (Fig. 15.).

**KSYM-250 HORIZONTAL and KFSM-250 VERTICAL AXLE FLAT GRINDING MACHINES** (Figs. 16. and 17.) These belong to the same machine family and 70% of their parts are the same. They are rigid, vibration-free and good for fine surface grinding. Their operation is semi-automatic, the control is electrohydraulic. The moving of the table is hydraulic, and the speed can be varied from 0.2-20 m/minute without using a gear. The motions of the table can be limited by bumpers. All motions are started at the push of a button. The smallest grip with either mechanical or manual motion is 0.005 mm; longest mechanical grip is 0.05 mm. The machines can be equipped with an active measuring device which also measures interrupted surfaces (Figs. 18. and 19.) The feeler of this device touches the pieces in a vertical plane parallel to the motion of the table. The feeler feels the size change occurred during the grinding due to a size-transforming inductive head and electronical evaluating instrument. This insures that the following switchings are made: 1. from roughing to leveling; 2. from leveling to sparking-out; 3. after sparking-out, when the desired size is reached, stop is automatic.

At the end of the process the table motion of the machine stops only when the grinding disc is in the end position cross-directionally too.

**KCH-63 TOPLESS GRINDING MACHINE** (Fig. 20.) This machine is indispensable for manufacturing quality mass products (such as rollers in the bearings industry). Topless grinding machines are being made with 10, 25, and 63 mm permeability. The KCH-63 type basic machine is mechanically operated; at present only the regulation of the grinding disc and its forwarding disc is hydraulic. A later, automatic form of this machine will be controlled by an active measuring device which will

adjust and run the saddle system accurately, according to tolerance. Then it will regulate the grinding disc and the forwarding disc, depending on the number of pieces and the time of grinding. It will also adjust the saddle system as it wears. This machine will be equipped (Fig. 21.) with automatic feeder to facilitate the grinding of anti-friction bearing rings and rollers and other similar pieces. The machine and its accessories grind steel, non-ferrous metal, plastics and other materials; it does roughing and leveling grinding for all of them.

Several other machine tools will be developed with the above machines. At the same time, the production of the older, technologically inferior machines will gradually stop. During the Second Five-Year Plan there will be some overlapping between the two types of machines, but by the end of this period the structure of our machine tool industry will be changed.

#### ILLUSTRATION CAPTIONS

- Fig. 1. EMU-200 INCREASED ACCURACY UNIVERSAL LATHE
- Fig. 2. RAM-16 PROGRAM-CONTROLLED TURRET-HEAD AUTOMAT.
- Fig. 3. E-400 UNIVERSAL LATHE
- Fig. 4. E-400 AUTOMAT.
- Fig. 5. ETP-500 PROGRAM-CONTROLLED PRODUCTION LATHE
- Fig. 6. " " " " " WITH FEEDER
- Fig. 7. RT-80 P PROGRAM-CONTROLLED TURRET LATHE
- Fig. 8. EM-500/320 PROGRAM-CONTROLLED SEMI-AUTOMATIC COPYING LATHE
- Fig. 9. " " AUTOMAT.
- Fig. 10. RTA-160 PROGRAM-CONTROLLED SEMI-AUTOMATIC TOWER-TURRET LATHE
- Fig. 11. " " AUTOMAT
- Fig. 12. MUP-320
- Fig. 13. MU-320 AUTOMAT
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- Fig. 16. KSVM-250 HORIZONTAL AXLE FLAT GRINDING MACHINE
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- Fig. 19. KSFM-250 (WITH ACTIVE MEASURING DEVICE)
- Fig. 20. KCH-63 TOPLESS GRINDING MACHINE
- Fig. 21. " " AUTOMAT.

INCREASING TECHNOLOGICAL ORGANIZATION AND DISCIPLINE  
IN THE HUNGARIAN MACHINE INDUSTRY

Following is the translation of article by Geza Lang in  
Gepgyartas Technologia, Vol I, No 3, Budapest, 1961, pages  
92-95./

The College of the Ministry of Steelmills and Machines decided last March to carry out a series of motions designed to improve technological organization and discipline. The goal of the orders, as comrade Sebestyen Endre Bakonyi, First Deputy Minister, emphasized in the first issue of this journal, is "to improve the technological organization and discipline in all the machine factories under the Ministry by the end of 1962. The principal means of execution is the planned, organized, and rewarded exchange of working methods." Comrade Bakonyi urged the editors of this journal to be controllers of technological improvements and of the planned and organized experience exchanges. This is the first in a series reporting this program.

Central Orders Preceding Experience Exchanges

The following important moves were initiated by central organizations to facilitate the program:

1. The Technological Institute of the Machine Industry (TIMI) worked out the degrees of detail demanded by product and technological documentation. This contains the format and content demands of the various grades. They were worked out according to the product and the method of production.

2. Factories were appointed where preliminary studies showed that their technological organization and discipline can be developed within a short period and where they will be available for "exporting" their methods.

As a first step, 12 factories were named. These are in the custom and small series category: the Csepel Custom Machine factory, the Miskolc Heavy Tool Machinery factory and the Hungarian Optical Works (HOW). In the small and medium series category: the Small Motor and Machine factory, the Gyor Tool Machinery factory and the Godollo Machine factory. In the medium and large series category: the DINAMO Electric Motor factory, the Press and Forging factory, and the Danuvia Tooling Machine factory. In the large series and mass production category: Ganz ammeter factory (Godollo) and HOW; as a mixed series foundry, Csepel Iron and Steel foundry; as a mixed series forging factory, Csepel Forging factory.

3. Appropriate departments of the Ministry and TIMI visit the

factories and check their state of technological organization and discipline. They decide what must be done to reach the level where the factories can become experience-exporting factories. Methods and principles of this step were developed in the TIMI and were published by the official courier of the Ministry.

#### Visit in the Small Motor and Machine Factory

We visited the Small Motor and Machine factory to see what has been done to reach the level where they can serve as a model factory for technological organization and discipline.

Jozsef Hantos, manager, Janos Javor, chief technologist (both of the factory), Andras Szentesi, head of the Technological Department in the Transportation Directorate of the Ministry, Istvan Kun, chief technologist in the same Directorate, and Maria Turcsanyi and Robert Ohrmacht of the TIMI participated in the discussion.

This factory is a small and medium series plant. They produce and develop diesel and gasoline engines under 30 hp and participate in the national dieselization program. Feed pumps and regulators (for the Ganz motors), charge controls for diesel locomotives, and remote controls for ships are among their products.

We asked the question: how did the workers receive the news that their factory was selected as a model factory? Comrade Hantos told us about his conveying the decision to factory council meetings. The workers saw that the decision signifies appreciation for the good work of the factory, but opinions were heard that it also means new tasks and difficulties for the engineers. This is undoubtedly so, because in order to teach other factories they must first reach a certain level of efficacy.

This, is, however, very useful. Documentation can be improved and technological discipline can be elevated, so that by the time they must be ready to teach, they will have greatly improved themselves.

About the present technological level: in chipping, for nearly 100% of the repeatedly produced parts, processing orders with figures are made. These are so detailed that they substitute the blueprints completely. Technological documentation is also made of assembly in the form of assembly descriptions or assembly orders with figures.

In the chipping processes everywhere in the assembly shop this year, trays are being used. The tools, equipment, templates, certificates, materials, and process orders are given to the workers at the beginning of the day so they will not waste time by getting them. The machine shop does not have a grinding machine; the tools are sharpened centrally. The tools are checked after work and, if needed, repaired. Only afterward do they return to the storeroom.

The Technological Department and the organization of the factory in general insure technological discipline. The norm office, the equipment storeroom, and the pattern shop are under the chief technologist. He directly oversees the equipment and tool shop. It can be said that the cooperation between the Technological Department, the Program Office

and the Cost Calculation Office is very close. The amount of tools and the equipment time needed for new products is determined by economic calculations.

Experimental prototypes are made in the production shops. Process directing is also made for the prototypes. This makes the accurate programming of experimental production possible.

Material norms are being made by the Technology Department according to the blueprint and the technological documentation. To insure good material economy for forged parts and when using special casting methods, the Technology Department draws the prefabricate.

One of the most important things other factories can learn from them is the very high level of technological discipline, from the preparation of the production to the end product. Process order changes or extra wages can only be obtained from the chief technologist.

Finally, we asked what changes are being made to reach the level required by the Ministry. We learned that the management and the Transportation Department of the Ministry decided to release the documentation of the SL type, four-stroke, air-cooled gasoline engine. When the experience exchange takes place, this engine will probably be in production and the factory will be able to demonstrate the entire technological process. Technological documentation of the product will be checked and, where necessary, completed. Although equipment design is directly under the Technology Department, the technological work will be done by them. Technological criticism of constructions will be made more organized, even though several designers are working in the design department who were formerly technologists.

#### Visiting the DINAMO Electrical Motor Factory

Istvan Haraszti, chief engineer, Endre Andics, chief technologist, Karoly Kiss, the head of the technological department at the DINAMO, Aron Takacs, chief technologist of the Power Current Installations Directorate and Robert Ohrmacht of the TIMI participated in the discussion on the program in the DINAMO Electrical Motor factory.

The factory produces medium and large series motors. They make and develop squirrel-cage and slip-ring asynchronous motors between 0.6 and 30 kW. Its biggest series is 0.6-10 kW motors, particularly 3 kW motors.

The workers of the factory greeted the Ministry's decision with joy. The Directorate, however, has a problem in how to define the theme of the exchange. The difficulty stems from the fact that while factory's organization of production is among the best in Central Europe, a similar organization in other factories belonging to the Directorate requires thorough cost analysis. Here the coiling, painting, and assembling of the motors is 94-97% continuous. Seventy percent of the chipping is done by automatized machine lines. The factory plans to automatize chipping still further.

The factory has six assembly lines. Of these, three in the coiling shop and two in the assembly are of limited speed.

Painting and drying are continuous. The shop was recently made into split levels; this resulted in a significant gain in working space.

The engine-house-making machine row is in operation. The row has six stations, ten unit heads, and 50 tools; it replaces 21 tooling machines. A small engine-house is made every two minutes on the average. The tools are sharpened after every two shifts. The row can be rearranged in three hours if the type of house is the same and only the length is different. Rearrangement for another type of house takes 12 hours.

A considerable part of the inner transportation is done by conveyors.

The number of pieces of the types produced monthly puts production between the small and medium series, but the fact that the parts of the motors of various kinds and sizes differ only generally in size makes assembly coiling, assembling, and painting possible for smaller (30-50) series by changing the speed of the belts.

The preparation and organization of continuous production was done by the factory personnel. It necessitated a detailed analysis of the whole production process and the synchronization of steps. However, the contents and format of technological documentation relevant to the process are not yet final.

Details of the nonassembly production processes is determined by the number of pieces per year. After this is done, processing orders (with figures) are drawn up. Technological documentation goes to the foreman, who prepares the shop. The workers are mostly semi-skilled.

What are the most important features that can be copied from DINAMO?

1. It was made obvious by DINAMO that even for small and medium series, if the parts of the various types differ only in size, continuous production is possible.

2. Closed cycles, where the grouping of the various parts and the processing times are synchronized, create continuous motion. This was demonstrated in the production of revolving parts of various sizes. Production can thus be doubled.

3. Continuous production -- such as assembly-belt construction of electric motors -- decreases needed working space to one-fifth of its former size.

The factory is presently engaged in working out "type technologies" for the various parts and for the assembly step. These documents give the most progressive technology, the order of steps, etc. This type-technology is strictly adhered to, it can be supplanted only by a more progressive technology. In the same manner, general assembling orders will also be made before the experience exchange.

#### Further Tasks in the Experience Exchange

After the 12 factories reach the desired level in technological organization and discipline, the Ministry designates 39 factories as recipients. These factories in turn will teach another group of factories the second step after they have mastered the techniques shown

to them.

Experience exchange starts on 1 August 1961. Both the teaching and the receiving factories' managers are responsible for the execution of the exchange. Directing the exchange is the responsibility of the chief engineer. The actual exchange is done by the technological departments of the two factories.

The teaching factories must present the documentation of a product made at the time of the exchange. They also have to show the entire production process of that product.

The teaching and the three receiving factories must work out a detailed, scheduled program for the exchange. The programs must be approved by the directorats of the Ministry after hearing the opinion of the TMI.

In the third step of the experience exchange, the 51 well-organized factories give their experiences to another 153 factories so that by the end of 1962, they can reach the level of the teaching factories.

In order to insure further publicity for this program, this journal will visit the other factories participating in the exchange.

We also ask the workers of the participating factories to submit their suggestions and results to this journal; the readers can profit from them.